

METHOD OF PRODUCING HOSE-LIKE KNITWEAR

Field of the Invention

The present invention relates to a method of producing hose-like knitwear, so as of a sock, etc., which knitwear is closed at one end by using a one-cylinder circular knitting machine provided with an dial plate situated above a needle cylinder and equipped with dial sinkers to be used for co-operation with needles during make-up and transferring the knitwear.

Background of the Invention

Small-diameter one-cylinder circular knitting machines for production of hosiery and similar goods equipped with a device used to close the toes directly in the machine by means of an overturnable half-plate situated above the needle cylinder of the machine are known. This half-plate is equipped with transferring sinkers of special forms. The transferring sinkers have controlling butts to both sides to be controllable in both of their positions for the purpose of receiving and handing over of knitting loops in forming closed toe, and also in the basic non-overturned position in the hanging up of a double welt. The

transferring sinkers cooperate gradually in knitting of a closed toe with both half-circles of needles. At first, with the first half of the needles, the so called heel needles during the make-up of loops before formation of a toe pouch by means of a reciprocation run of the needle cylinder and, at second, during the transfer of the retained knitting to the needles of the second half-circle, after overturning the half-plate, which needles correspond to the instep needles and this in closing the knitting of toe. The transferring dial sinkers of the half-plate are of a very filigree workmanship and with big demands on accuracy, mounting and controlling to accomplish a perfect transferring of the loops from the heel arch to the instep arch. However, in knitting for example of the double welt, this device works as an integral part of the dial and so in fact it limits the function or the possibilities of the dial plate as such, particularly with regard to the limited workmanship and arrangement possibilities of the half-plate cams with regard to the built up space.

Another disadvantage consists in that during overturning of the half-plate the loops that are overturned only at the distance of one needle, i.e. the loops on the ends of the knitting arc, cause holes in the knitting at the knitwear toe and consequently its worse quality. This is because the end loops are the most stretched ones during the overturning process.

Accordingly, it is an object of this invention to solve a high-quality toe closing directly in the machine and without limiting the dial function.

Summary of the Invention

The invention is characterized in that at first make-up of the toe knitting on needles and the first half of the dial sinkers corresponding to the heel part of the knitwear is carried out, whereafter, the toe pouch is knitted in reverse run on the first half-circle of needles, and the part of the knitwear, which is retained on dial sinkers, having been knitted on the first half-circle of needles, is transferred onto the transferring means and it is transferred towards the second half of the apparatus sinkers, whereafter, it is transferred on them and from them it is then transferred to the corresponding needles of the second half-circle. Further, it is preferable if the part of the knitwear retained on the dial sinkers is taken off the dial sinkers by the transferring means and it is overturned by 180° by them towards the second half of the dial sinkers, which sinkers take it off the transferring means and then it is transferred from the dial sinkers of the second half-circle, on the needles of the second half-circle.

It is another advantage that by retracting the first half of the dial sinkers with loops of the retained knitwear part towards a smaller diameter the loops are taken off and hanged on the working ends of the transferring means and after overturning by 180°, by putting out of the second half of the corresponding retracted dial sinkers, the loops of the overturned part of the knitting are taken off the working ends of the transferring means and they are transferred above the needles of the second half-circle, which needles then lift and take it over.

Further, the one-cylinder circular knitting machine according to this invention for production of hose-like knitwear, such as socks, etc., that are closed at one of their ends, provided with an dial plate situated above the needle cylinder of the machine and equipped with dial sinkers for cooperation with needles during transferring of the knitting is characterized in that it is provided with a device for transferring the retained knitting of the toe pouch knitted on a half-circle of needles from one half of the dial sinkers to the other half of the dial sinkers.

It is an advantage that the device for transferring of the retained knitwear from one half of the dial sinkers to the other half of the dial sinkers is comprised of two half-circle plates arranged side by side and deposited controllably swingingly on the dial plate with 180° swing around its transverse axis and provided on their circular ends with adjacently positioned transferring sinkers angularly situated so that they reach in between the dial sinkers.

It is another advantage that the first transferring sinkers situated on one half-circle plate are on their working ends provided with hook-like ends with recesses and with the before them formed oblique edges for transfer of knitting loops and the other transferring sinkers are provided with rounded edges situated opposite to the recesses and the oblique edges of the first transferring sinkers.

Brief Description of the Drawings

The method and machine according to the invention are shown in drawings, in which:

Figure 1 is showing schematically a view from the outside of the position of needles, dial sinkers, transferring sinkers and the cast-off sinkers with the yarn position shown during make-up;

Figure 2 is showing schematically a hang up of the toe knitting beginning on transferring sinkers after knitting of the initial courses on needles of the first half-circle,

Figure 3 is showing schematically the position of the needles and the dial sinkers of both half-circles and the transferring device after the toe pouch knitting has been finished and before overturning,

Figure 4 shows the same as Figure 3 but after the transferring sinkers have been overturned,

Figure 5 is showing schematically the position of needles and of dial sinkers of the other half-circle and the taken out transferring sinkers after taking the toe knitwear off the transferring sinkers before transferring to needles,

Figure 6 shows the same as Figure 5 but after the transfer to the needles of the second half-circle,

Figure 7 shows a detail of an embodiment of the transferring sinkers situated in the closed position in the course of overturning.

Detailed Description of the Invention

A known one-cylinder circular knitting machine for production of hosiery goods is provided with needles 1 (Fig. 1) mounted in the needle cylinder and cast - off sinkers 2 mounted in the sinker cap. Further, the machine is provided with a known dial plate 3 (Fig. 2) mounted coaxially above the needle cylinder. Apart from a cutting saw and a holding device the dial sinkers 4 are slidably mounted here in its radial grooves, which dial sinkers 4 are arranged on one half of its circumference, which half corresponds to the heel needles 1, as well as the dial sinkers 4' (Fig. 3) arranged on the other remaining half, both serving commonly for cooperation with needles 1 in retaining of the knitting when the double welt of the knitwear is knitted, whereby, their arrangement and number corresponds to the cast - off sinkers 2.

According to the invention the machine is provided with a device for transferring of the on the dial sinkers 4 retained half-circle part of the reciprocaly knitted toe pouch of the

knitwear on the other, i.e. the remaining part of the dial sinkers 4' for the purpose of closing the toe.

This device or means are arranged on the dial plate 3. This are two half-circle plates 5, 6 arranged side by side on the bottom side of the dial plate 3 and mounted controllably swingingly in the extent of 180° around its transversal axis, each of them by means of its geared wheel 7 and geared rod 8 engaging with each other, whereby, the geared rods 8 are controlled by pneumatic pistons. On the circular edge of the first plate 5 the first transferring sinkers 51 are mounted, which sinkers 51 are angularly situated so that they reach in between either the dial sinkers 4 or 4' according to in which end position they are placed. On the circular end of the other plate 6 the other transferring sinkers 61 are mounted, which sinkers 61 also reach according to the position in between the dial sinkers 4 or 4'.

The first transferring sinkers 51 are adjacent to the second transferring sinkers 61. In the basic position, both half-circle plates 5, 6 and, therefore, also the first transferring sinkers 51 and the second transferring sinkers 61 are slightly angularly separated in a very sharp angle so that there is place between them for passage of loops of the transferred stitches. This position is secured by various non-shown stops of both half-circular plates 5, 6 that are arranged at the bottom of the dial plate 3. The cooperating ends of the adjacent transferring sinkers 51, 61 are adapted for mutual cooperation. On the first transferring sinkers 51 hook-like working ends are formed provided with recesses 510 (Fig.

7) and with oblique edges 511 formed in front of them for transfer of said loops on them. The working ends of the other transferring sinkers 61 have rounded edges 610 for throwing off said loops, which edges 610 are situated opposite to the recesses 510 and oblique edges 511 of the first transferring sinkers 51. All said transferring sinkers 51, 61 in basic position are arranged at the height level of the dial sinkers 4, whereby, the radius at which their working ends are situated is smaller than the radius where the stitch loops of the transferred knitting are resting on dial sinkers 4 during making - up of the thread at the beginning of the knitting of the toe pouch, but larger than the radius where the hooks of the fully retracted dial sinkers 4 or 4' are situated.

Function of the above described apparatus is as follows: A sock is knitted from the toe to the welt. At the beginning the make - up of knitting is performed during reciprocation of the machine on the first half-circle, i.e. on needles 1 and the dial sinkers 4 that correspond to the heel or the sole part of the knitwear.

At first, during rotation of the needle cylinder in the direction of the rotational knitting, the thread P is engaged by even needles 1 so as it can be seen in Fig. 1, and after reversal of the rotation direction, by the odd needles 1. After a partial retraction of the dial sinkers 4 and knitting of several reverse courses under narrowing of stitches, while the knitting is retained on the dial sinkers 4, the dial sinkers 4 are fully retracted to the most distant position, so as it can be seen in Fig. 2.

In the process of retracting the dial sinkers 4 the loops of the retained thread P are carried by hooks of the dial sinkers 4 in the direction towards the centre and, thereby, during the movement of the hooks to a radius smaller than what is the radius formed by recesses 510, they slide along the oblique edges 511 of the transferring sinkers 51 till they finally fit into the recesses 510, so that the knitting is further held on the transferring sinkers 51.

Then it is continued in the reciprocal knitting of the toe pouch V under narrowing and then adding of needles 1. After the toe pouch V on the first half-circle of needles 1 has been finished, by a synchronised movement of pneumatic pistons and by means of the geared wheels 7 and the geared rods 8, at first, the half-circle plate 6 swings from the basic position downwards so that the recesses 510 are closed by the rounded edges 610 and so in the following action the toe pouch V cannot fall off the transferring sinkers 51 and 61, so as it can be seen in Fig. 3.

Only then the half-circle plate 5 swings from the basic position and subsequently both plates are simultaneously overturned by 180° clockwise so that their transferring sinkers 51 and 61 get to the same height level as the dial sinkers 4' on the other half. The dial sinkers 4' are fully retracted, so that the tips of the transferring sinkers 51 and 61 are at a greater radius, so as it can be seen in Fig. 4. But the half-circle plate 6 impacts on a non-shown stop so that again, as in the basic position before the overturning, both half-circle plates 5 and 6 are deflected from each other and the recesses 510 are opened so

that they are not closed by the rounded edges 610 on which, after the act of overturning, the loops of the overturned knitting of the toe pouch V hang now. By the above described overturning of the transferring sinkers 51 and 61, the retained edge of the toe pouch V gets with them on the other half of the dial plate 3 provided with dial sinkers 4', i. e. on the instep side of the knitwear.

Then, the up to now retracted dial sinkers 4' are moved out into the front position and from the transferring sinkers 51 and 61 they take the corresponding half-circle of the heel pouch V so as it can be seen in Fig. 5. In practice, it is done so that the hooks of the dial sinkers 4' get into the loops of the knitting and by their vertical edges while moving out of the centre they take the loops off the rounded edges 610. Then, the corresponding needles 1 of the second half-circle, up to now not participating in the knitting, lift and in a known way, take off the edge of the overturned knitting of the toe pouch V from the now again receding dial sinkers 4', whereby, the toe knitting is closed by this last step and it is now placed on all needles 1 so as it can be seen in Fig. 6.

In the next processing, the sole, instep, heel, calf, and the welt terminated by a course which does not unravel, are knitted by a common method.

Within the scope of the invention, the circular knitting machine can be used particularly for production of hosiery with closed toe, but can be also used for production of any hose-like products closed at one end.

Within the scope of the invention, it is possible to make various modifications and changes of the circular knitting machine without departing from the scope of the claims. At the same time all parts can be substituted by their technical equivalents.